KNIGHTLY BRIDGE
(Bridge No. 6149)
Spanning the Middle River on Virginia Route 778
Knightly Vicinity
Augusta County
Virginia

HAER No. VA-100

PHOTOCRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERINC RECORD
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HISTORIC AMERICAN ENGINEERING RECORD
KNIGHTLY BRIDGE
(BRIDGE NO. 6149)

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LOCATION: Virginia State Route 778, over the Middle River, Knightly vicinity, Augusta County, Virginia. USGS Fort Defiance, VA Quadrangle, Universal Transverse Mercator Coordinates: 17.681420.4233140

DATE OF CONSTRUCTION: 1915

BUILDER: Champion Bridge Company, Wilmington, Ohio

PRESENT OWNER: Virginia Department of Transportation

SIGNIFICANCE: The Knightly Bridge is a representative example of a pin-connected steel Camelback truss typical of early twentieth century factory-manufactured bridges.

PROJECT INFORMATION: The Knightly Bridge was recorded in 1993-1994 by the Cultural Resource Group of Louis Berger & Associates, Inc., Richmond, Virginia, for the Virginia Department of Transportation (VDOT). The recordation was undertaken pursuant to provisions of a Programmatic Memorandum of Agreement (Draft) among the Federal Highway Administration, VDOT, the Virginia SHPO, and the Advisory Council on Historic Preservation concerning management of historic metal truss bridges in Virginia. Project personnel included Richard M. Casella, Architectural Historian; Alison Helms, Historian; and Rob Tucher, Photographer.

DESCRIPTION

The Knightly Bridge (VDOT Bridge No. 6149) is a single-span pin-connected steel truss bridge which carries State Route 778 over the Middle River in Augusta County, Virginia. It is located approximately one-quarter mile south of the settlement of Knightly and the junction of State Routes 778 and 777 (Figure 1). At the point of the bridge, the riverbed is about 110' wide, spanned by the truss at a height of approximately 22' above the water. At low water, the river is 2' deep at the center of the channel. The immediate area around the bridge is open rolling farmland and pasture with widely spaced farm complexes and residences.

The truss of the Knightly Bridge is of the Camelback type, a variation of a Parker truss defined by a top chord with a total of five slopes. The Parker truss is a Pratt truss with polygonal top chords. All members of the bridge are steel, joined with pinned, riveted, or threaded connections. The truss is 18' 4" wide and 28' high, with ten panels each 17' 10" wide, and an overall length of 181' 9" (Figure 2).

Top chords and inclined end posts are riveted box sections, 14" x 9-1/2" overall, consisting of 9" x 2-1/2" side channels with flanges turned out, 14" x 1/4" top plate, and 1-3/4" x 16" x 1/4" bottom lattice-bars. Bottom chords consist of doubled loop-welded eye-bars of three sizes. The bottom chords at panels one and two are continuous and measure 2-1/4" x 7/8". The other bottom chords measure 3-1/2" x 3/4" at panel three, 4" x 1" at panel four, and 4-1/2" x 1" at panel five. The truss rests on 20" x 24" bearings; the north bearings are of the plate-and-roller type and the south bearings of the fixed bed-plate type.

The box-section bar-lattice posts measure 11" x 6" overall. They consist of 6" x 2" channels, spaced 7" apart, with flanges turned out, connected by 1-1/2" x 13" x 1/4" single bar-lattice.

Diagonal panel braces are double loop-welded eye-bars. Panel two diagonals measure 2" x 7/8", the diagonals in panels three and four measure 1-1/2" x 3/4", and panel five diagonals measure 1-3/4" x 1". Adjustable counters are square loop-welded eye-bars with upset threads and turnbuckles, measuring 7/8" in panel four and 1" in panel five.

Hip verticals are single 1-1/4" square loop-welded eye-bars. They attach with a pin to a riveted H-section floor beam hanger built with two 5" x 1-3/8" channels spaced 7" apart. Bridge pins measure 2-1/4" and 2-3/8".

Portal struts consist of a double-intersecting Warren truss girder, 3' 3" high by 6-1/4" wide. Top and bottom flanges are riveted T-sections, 6-1/4" x 3", built of 3" angles. Webbing consists of 2" angles. The strut is braced with T-sections identical to the flanges. Upper lateral struts are lattice-bar I-sections, approximately 8" x 3" overall, consisting of T-section flanges and lattiee-bar webbing. Sway bracing consists of two 3" angles and intermediate struts,

identical in construction to the upper lateral struts described, located 18' 5" above the deck. Upper lateral bracing rods are 3" x 4" angles.

The floor beams on all three trusses are 15" x 5-1/2" rolled I-beams, riveted with angles to the posts, which hang from the bottom chord pins. Floor beams at the hip-vertical location are carried by the short post sections previously described. There are ten floor stringers variably spaced between 18" and 26" on eenter. The two outside stringers are 7" channels and the eight inside stringers are 8" x 4" rolled I-beams. Bottom lateral braces are 1" rods, threaded at both ends, and attached to the floor beams with skewback brackets.

The bridge decking consists of 4" x 10" pressure-treated wood planks, coated with asphalt and attached to the stringers with carriage bolts and deck clips. The roadway is 14' 6" wide and edged with 4" x 6" wood curbing raised 4" off the decking with wood blocks spaced approximately 4' on center. The bridge railings are of double lattice-bar construction, 24" x 1-1/2" overall, and hung from the posts with short sections of 7" channel.

The concrete bevel-wing abutments measure 20' across the face and approximately 18' high. The wings are stepped in 2' increments along their length.

A cast iron bridge company plaque, decorated in the Stick style, is bolted to the top center of the portal strut at the south end. The plaque reads:

1915
Champion Bridge Co.
Wilmington, O.

HISTORICAL INFORMATION

Background

Planters in the Middle River Valley specialized primarily in tobacco until about 1790, when, during the French Revolution, the price of wheat in Europe soared, encouraging many valley farmers to convert to wheat crops (Upper Valley Regional Park Authority n.d.:2). Gristmills were established as the population expanded, and production of grain increased. In addition to providing the basic service of processing grain to valley farmers, mills functioned as informal gathering places, where agricultural techniques, politics, religion, and other matters of local interest were discussed. The road network that developed in Augusta County during the late eighteenth and early nineteenth centuries connected farms to mills and other commercial and community centers. In 1885, there were eighty-one gristmills, sixteen sawmills, five

combination mills, one plaster mill, and one carding mill in Augusta County. The distribution of the mills was such that no resident needed to travel more than five miles to reach a mill (Hamrick 1982:4-6; Hotchkiss 1865, 1885:76-77; May 1987:405; Nutt 1992a).

The 120-acre tract of land surrounding the milling community of Knightly was granted to Robert Wiley in 1760 (see Figure 1). The first mill in the area was established on the southeast side of the Middle River between 1807 and 1819 by Jacob Fisher, who secured from the Augusta County Court the right to build a dam and to quarry from the river as much rock as needed for the abutments. In 1819, Jacob and David Humbert purchased the mill seat established by Fisher, with the right to raise the dam, and a right-of-way for a wagon road along the Middle River. The Humberts acquired a half interest in the dam by an agreement with Andrew Allison, who owned the adjoining property on the northwest side of the river. In 1833, after Allison's death, the Humberts purchased full interest in the dam (May 1987:405-406).

The Humberts expanded and diversified the water-powered mill buildings during their thirty-four year period of ownership. On January 22, 1853, the Humbert Merchant mill and sawmill were sold to Samuel Garber, who, along with William Beard, operated the complex under the name of Hope Mill until 1858. By 1858, when Beard sold his half interest in the mill property to Mansfield Marshall, the Hope Mill tract contained merchant, grist, saw, and plaster mills situated on both sides of the river (May 1987:406-407).

Prior to the Civil War, Christian Cline purchased one-half interest in the merchant mill tract. Cline operated the mills during the war. According to one local source, the mills were burned around the time of the battle of Piedmont, in 1864. Another source recalls that the mills were destroyed in the flood of 1870. Cline rebuilt the mills, and with his associate, John Wampler, added other properties to the original tract over the next forty years. The partners formed the Cline and Company Real Estate business, expanded the capacity of the mill, and shipped flour produced at the mill from a warehouse near the Fort Defiance Depot on the Valley Branch of the Baltimore & Ohio Railroad (Hotchkiss 1865, 1885:76; May 1987:407-408; VDHR file 7-1069).

Christian Cline died in 1894, and in June of 1896, John Wampler conveyed one-third interest in the mill property to John M. Cline, and Cline then had full title to the property. Seven years later, on May 31, 1905, the Cline & Wampler Mill tract was transferred to Joseph Norford and Daniel S. Garber, partners in the Knightly Milling Company (May 1987:407-408). The Knightly Mill generated more horsepower than any other mill on the Middle River. In 1915, Colonel Roller, of the Augusta Military Academy, convinced the mill owners to add a generator and power lines. The electrical system, which ran from New Hope to Roller's School, was one of the first of its kind in the county (Hamrich 1982:12; Nutt 1992a; VDHR 7-1069).

History of Knightly Bridge

Knightly Bridge was completed in the spring of 1915, after the Knightly Milling Company petitioned for construction of a bridge near its mills. The bridge spans the Middle River just south of the community of Knightly on the road connecting New Hope, Piedmont, and Mount Sidney. The precursor to State Route 778 was in place by 1865, crossing the river close to the location of the present bridge. An early nineteenth century dam, built to provide waterpower for the mills on the south side of the river, may have provided the first bridge across the Middle River in this area (Hotchkiss 1865, 1885:76) (see Figure 1).

On October 25, 1909, five and one-half years before the bridge was finally built, the Knightly Milling Company petitioned the Augusta County Board of Supervisors to have a bridge erected over the Middle River at its mills. The petition was referred to the members of the Road Board of Middle River District, who were directed to examine the site and make a report (Augusta County Board of Supervisors Order Book 5:148).

After a four-month period, the road board filed their report with the Board of Supervisors, on February 28, 1910. The milling company, represented by its attorney, H.H. Bleaser, was present for the ensuing discussion, but a resolution was not reached and the matter was delayed for another seven months. On September 26, the Board of Supervisors referred the Knightly Milling Company Bridge matter back to the Road Board for a further report and a cost estimate (Augusta County Board of Supervisors Order Book 5:178, 229).

Either the cost of the proposed bridge at Knightly Mills was too great for the county to bear at the time or the Board of Supervisors was not convinced that the bridge was a public necessity. The matter was dropped for four years, until the petition was reinstated on April 23, 1914. One month later, the matter was referred to the County Superintendent of Roads for cost estimates and a report on the importance of the proposed construction. After submitting the report, the Superintendent was requested to file plans and specifications with the Board (Augusta County Board of Supervisors Order Book 6:6, 15).

On June 4, 1914, the Board of Supervisors approved the construction and directed that the bridge superstrueturc consist of one iron span measuring 175' long and 16' wide, at a cost not to exceed $3,000. The petitioners agreed to be responsible for building abutments of either stone or concrete according to plans and specifications provided by the Superintendent of Roads. Filling associated with construction of approaches was to be donc free of cost to the county, and if a change in the location of the present road was necessary, the petitioners were to be responsible for securing the right-of-way (Augusta County Board of Supervisors Order Book 6:29).

One of the petitioners was Daniel S. Garber, a farmer from Mount Sidney, who owned the Knightly Mill property from 1905 until 1925 (May 1987:408; Rohrer & Diamond 1899:52). Garber agreed to build the abutments, fill in the approaches, and secure the right-of-way. The county was to help with this aspect of the work by lending the use of one of its steam oil drills free of charge. The cost of bridge construction was to be paid out of the County Levy for 1915, after December 1, 1915. The entire project was to be conducted under the supervision of the Superintendent of Roads, who was ordered to report to the Board upon completion of the work (Augusta County Board of Supervisors Order Book 6:29).

On August 27, 1914, Supervisor John G. Fulton presented to the Board a contract negotiated between Augusta County and the Champion Bridge Company of Wilmington, Ohio, to construct the superstructure for the bridge over the Middle River at the Knightly Milling Company. The contract stated that the bridge was to be made of iron, that it would measure 175' long with 16' "driveway," and that the price would be $3,625 (Augusta County Board of Supervisors Order Book 6:51).

Daniel Garber began the construction of the abutments and approaches to the bridge in the winter of 1915. The petitioners had originally agreed to build the abutments and approaches for an estimated $2,200. Garber himself had advanced $1,800 toward the cost, but could not persuade the other petitioners to donate more than $250 to $300. On April 22, 1915, he approached the Board of Supervisors requesting $250 to complete the project, and this request was granted (Augusta County Board of Supervisors Order Book 6:145). On that same day, the Champion Bridge Company was paid $3,728.55 for completion of the superstructure for the bridge (Augusta County Board of Supervisors Order Book 6:144).

A historical photograph of the bridge, taken in the spring of 1915 during the final phase of construction, while the northern approach was in the process of being filled, shows five men standing on the floor of the superstructure inspecting the work. The view looks to the southwest, with Knightly Mill in the center background (Nutt 1992b, courtesy of the Hamrick Collection).

The Knightly Mill property was purchased by the Knightly Light and Power Company after the death of Daniel S. Garber in 1925. Knightly Light and Power conveyed the buildings, machinery, equipment, and water rights to the Virginia Public Service Company in 1931. Virginia Light and Power subsequently razed the buildings and discontinued milling and power generating at the Knightly facility (May 1987:408; VDHR 7-1069).

The Parker Truss

The Parker truss was introduced by C.H. Parker in the 1870s. Parker utilized a quadrilateral truss of the Pratt type with posts in compression and diagonals in tension, but varied the length of the posts based on the strains exerted on them at a given location. The center of the truss, where the strains were the greatest, required the tallest panels, with the posts becoming successively shorter toward the ends of the bridge. The primary advantage of the design was a reduction in the weight of the bridge, or the dead load, permitting longer spans without increasing the sectional area of the bridge's structural members. A savings in material cost was a direct result; however, this advantage was largely offset by the cost of having to fabricate a greater variety of members. The most economical compromise was struck with a modification of the design limiting the number of variations in the slope of the top chord to three, for a total of five polygonal segments. This variation of the Parker truss is called a Camelback truss. In general, the Parker, or Camelback, truss becomes economical for bridges over 160' long (Comp and Jackson 1977:5; DuBois 1900:58-59; Kunz 1915:170; Waddell 1916:24).

The Champion Bridge Company

The Champion Bridge Company was founded by Zimri Wall, who was building wood truss bridges in Clinton County, Ohio, as early as 1860. In 1871, Zimri Wall was joined by his brother Jonathan to form Z. & J. Wall & Company. They began experimenting with wrought iron for bridge construction and patented an iron truss arch bridge in 1873 which they sold under the name "Champion Wrought Iron Arch." The partnership was renamed the Champion Iron Bridge & Manufacturing Company and the first fabrication shops were built in Hamilton, Ohio (Miars 1972:7).

The operation moved to Wilmington, Ohio, in 1875. It incorporated in 1878, and changed its name to the Champion Bridge Company in 1881. Abel C. Briggs joined the firm in 1884 and held the position of Chief Engineer from 1885 to 1916, and President from 1916 to his retirement in 1934 (Miars 1972:15). Champion expanded rapidly during the period 1885-1910 and opened offices in Birmingham, Atlanta, and Chattanooga to reach the southern market. A major expansion and modernization of the fabrication shops was undertaken in 1893 (Miars 1972:19).

Cash L. Richardson was hired by the company in 1905 as erection foreman and achieved recognition upon his death in 1965 for having erected more bridges than any other person in the United States. Richardson was responsible for the erection of most of the Champion bridges in Virginia, including the 1,023' New River Bridge at Narrows, Virginia, one of the heaviest bridges built by the eompany. This five-span Camelback truss bridge was replaced in the 1960s (Miars 1972:23, 27).

Through the twentieth century, Champion Bridge diversified its manufacturing capabilities to include concrete bridges, steel building frames, and material handling equipment. In the mid-1970s, the company ceased its bridge construction and repair operations completely, ending what may have been the longest continual operation of a bridge company in the United States (Miars 1972:33).

According to *A Survey and Photographic Inventory of Metal Truss Bridges in Virginia, 1865-1932*, a study conducted by the VDOT Research Council in 1973, the Champion Bridge Company built a total of forty-seven metal truss bridges in Virginia: twenty-six in the Staunton VDOT Construction District, five in the Culpeper District, one in the Lynchburg District, eleven in the Salem District, and four in the Bristol District (Deibler 1973). Two other Champion Company bridges, Mount Meridian Bridge (VDOT Bridge No. 6729) and Little Calfpasture River Bridge (VDOT Bridge No. 6081), both in Augusta County, are included in the seventeen historic metal truss bridges recorded by VDOT in 1993-1994, of which this report is a part.

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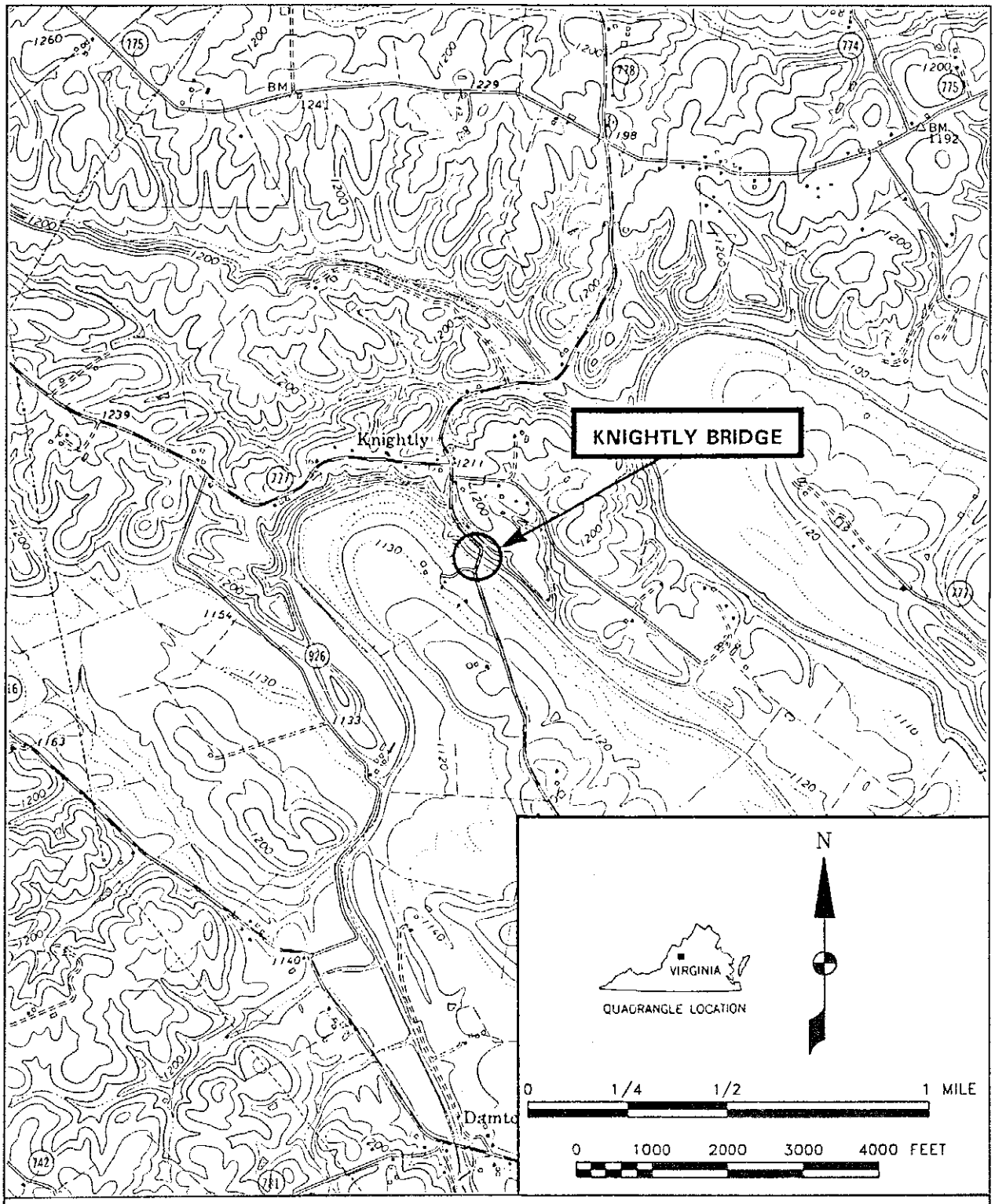

FIGURE 1: Location Map

SOURCE: USGS Fort Defiance, VA, 7.5 Minute Quadrangle, 1964 (Photorevised 1978, Photoinspected 1984)

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FIGURE 2: Original Bridge Report, Bridge No. 6149, March 5, 1972 *SOURCE: Virginia Department of Transportation 1972*